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SNOW AVALANCHE

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GENERAL RULES FOR
AVOIDING & SURVIVING
SNOW AVALANCHES



Pacific Northwest Region
USDA · Forest Service

INTRODUCTION

Large and small avalanches can have tremendous force and are a serious threat to winter travelers.

The more time that you spend in skiing, snowshoeing, snowmobiling, and other winter activities, the greater are your chances of being caught by snow avalanches.

Knowledge can help you avoid being caught by a snow avalanche; it will help you survive if you are buried.

Snow avalanches are complex, natural phenomena. Experts do not fully understand all the causes. No one can predict avalanche conditions with certainty. But the general guidelines in this folder will aid a thinking observer develop judgment about the presence and degree of avalanche danger.

Play safe. If in doubt, stay out of avalanche hazard areas. During periods of high or extreme avalanche hazard, back-country travel is not recommended and should be confined to avalanche-free areas.

SNOW AVALANCHES

There are two principal types of snow avalanches. These are loose snow and slab avalanches.

Loose snow avalanches start at a point or over a small area. They grow in size and the quantity of snow involved increases as they descend. Loose snow moves as a formless mass with little internal cohesion.

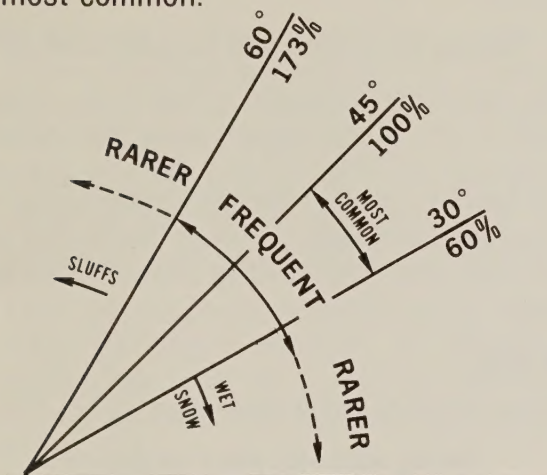
Slab avalanches, on the other hand, start when a large area of snow begins to slide at once. There is a well-defined fracture line where the moving snow breaks away from the stable snow. Slab avalanches are characterized by the tendency of snow crystals to stick together. There may be angular blocks or chunks of snow in the slide.

Slab avalanches are often triggered by victims themselves. Their weight on the stressed snow slab is enough to break the often fragile bonds

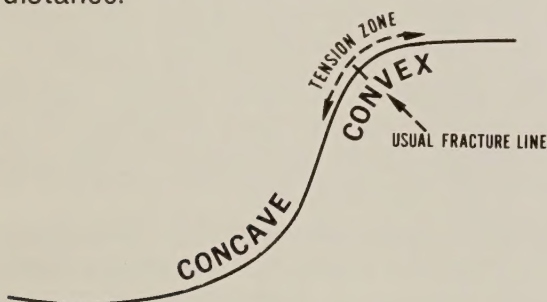
that hold it to the slope or other snow layers. Loose slides which trap victims are usually triggered by other members of the party or are triggered naturally.

TERRAIN FACTORS

Slope Steepness — Avalanches are most common on slopes of 30 to 45 degrees (60 to 100 percent), but may occur on slopes ranging from 25 to 65 degrees. The diagram below shows the slopes where avalanches are most common.

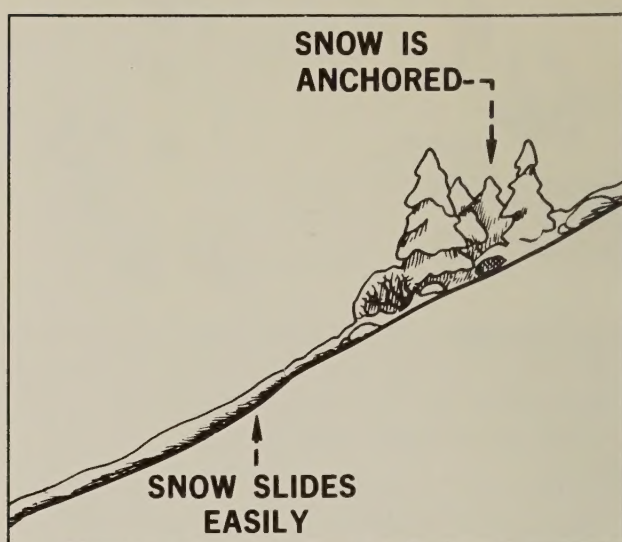


Slope Profile — Dangerous slab avalanches are more likely to occur on convex slopes, but may also occur on concave slopes. Short slopes may be as dangerous as long slopes; 42% of all avalanche fatalities result from slides running less than 300 ft/100 m slope distance.



Slope Aspect — Snow on north-facing slopes may be slower to stabilize than other aspects. South-facing slopes are especially dangerous in the spring due to solar heating. Leeward slopes are dangerous because wind-deposited snows add depth and may create unstable wind slabs. Windward slopes, generally, have less snow; and the snow is compacted, and usually more stable than leeward slopes.

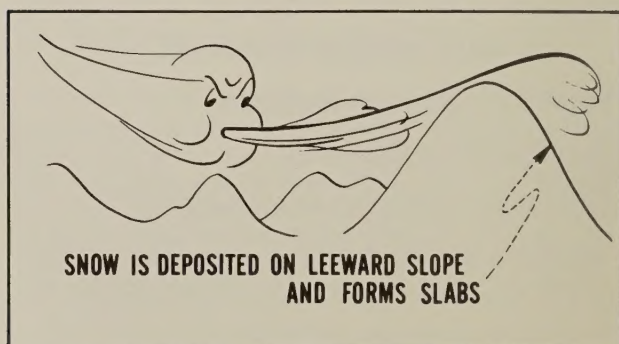
Ground Cover — Large rocks, trees, and heavy brush help anchor the snow. Smooth, open slopes are more dangerous, but avalanches can start even among trees.



WEATHER FACTORS

Old Snow — When the old snow depth is sufficient to cover natural anchors — such as rocks and brush — additional snow layers will slide more readily. The nature of the old snow surface is important. For example, cold snow falling on hard refrozen snow surfaces, such as sun or rain crusts, may form a weak bond. Also a loose, underlying snow layer is more dangerous than a compacted one. Check the underlying snow layer with a ski pole, ski, or rod.

Wind — Sustained winds of 15 miles per hour and over may cause danger to increase rapidly even during clear weather, when loose surface snow is available for transport. Snow plumes from ridges and peaks indicate that snow is being moved onto leeward slopes. This can create dangerous conditions.



Storms — A high percentage of all avalanches occur shortly before, during, and shortly after, storms. Be extra cautious during these periods.

Rate of Snowfall — Snow falling at the rate of 1 inch per hour, or more, increases avalanche danger rapidly.

Crystal Types — Observe general snow-crystal types by letting them fall on a dark ski mitt or parka sleeve. Small crystals—needles and pellets—often result in more dangerous conditions than the classic, star-shaped crystals.

New Snow — Be alert to dangerous conditions with a foot, or more, of new snow. Remember that new snow depth may vary considerably with slope elevation and aspect.

Temperature — Cold temperatures will maintain an unstable snowpack while warm temperatures (near or just above freezing) allow for snow settlement and increasing stability.

Storms starting with low temperatures and dry snow, followed by rising temperatures, are more likely to cause avalanches. The dry snow at the start forms a poor bond to the old snow surface and has insufficient strength to support the heavier snow deposited late in the storm.

Rapid changes in weather conditions (wind, temperature, snowfall) cause snowpack adjustments. Therefore, be alert to weather changes. Snowpack adjustment may affect its stability and cause an avalanche.

Temperature Inversion — Increasing temperature with elevation can occur when warm air moves over cold air trapped near the ground. This weather situation can occur in avalanche terrain throughout the Northwest and may produce dramatic variations in local snow stability.

Wet Snow — Rainstorms or spring weather with warm winds and cloudy nights can warm the snow cover. The resulting free and percolating water may cause wet snow avalanches.

Wet snow avalanches are more likely on south slopes and slopes under exposed rock.

GENERAL OBSERVATIONS

Old Slide Paths — Generally, avalanches occur in the same areas. Watch for avalanche paths. Look for pushed-over small trees, trees with limbs broken off. Avoid steep, open gullies and slopes.

Recent Avalanche Activity — If you see new avalanches, suspect dangerous conditions. Beware when snowballs or “cartwheels” roll down the slope.

Sounds and Cracks — If the snow sounds hollow, particularly on a leeward slope, conditions are probably dangerous. If the snow cracks and the snow cracks run, this indicates slab avalanche danger is high.

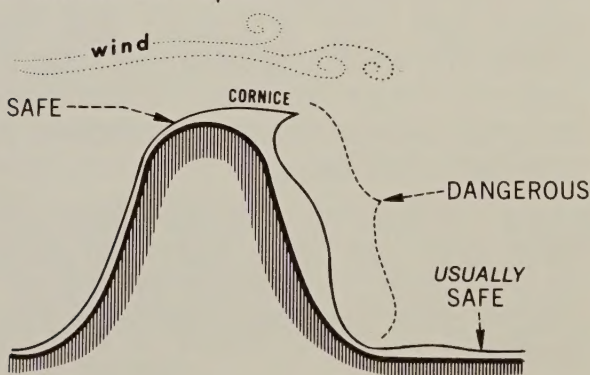
Information — Check the local weather and avalanche forecasts. Contact the Forest Service or the nearest winter sports area ski patrol.

Elevation — Although the avalanche danger generally increases with elevation, unusual weather conditions (for example, temperature inversion) combined with local topography may reverse this relationship from time to time.

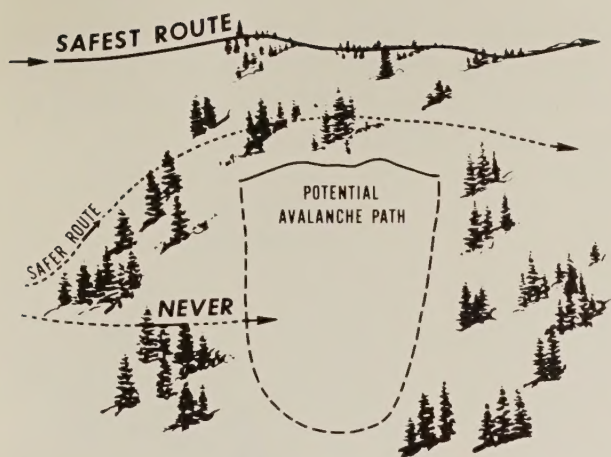
Volcanic Peaks — Above 8-10,000 ft on the volcanic peaks, significant avalanche hazard may exist during any time of the year.

ROUTE SELECTION AND PRECAUTIONS

The safest routes are on ridgetops and slightly on the windward side, away from cornices. Windward slopes are usually safer than leeward slopes. If you cannot travel on ridges, the next safest route is out in the valley, far from the bottom of slopes.



Avoid disturbing cornices from below or above. Gain ridgetops by detouring around cornice areas.



Route Selection — If you must cross dangerous slopes, stay high and near the top. If you see avalanche fracture lines in the snow, avoid them and similar snow areas.

If you must ascend or descend a dangerous slope, go straight up or down; do not make traverses back and forth across the slope.

Take advantage of areas of dense timber, ridges, or rocky outcrops as islands of safety. Use them for lunch and rest stops. Spend as little time as possible on open slopes.

Snowmobiles should not cross the lower part of slopes. Do not drive a snowmobile across especially long open slopes or known avalanche paths.

Obey signs closing slopes due to avalanche danger.

Only one person at a time should cross a dangerous slope. All others should watch him. Remove ski pole straps, ski safety straps, loosen all equipment, put on mitts, cap, and fasten clothing before you travel in any areas where there is avalanche danger.

Carry and use an avalanche cord or avalanche transceivers; carry a sectional probe and collapsible shovel.

AVALANCHE SURVIVAL

If You Are Caught in an Avalanche:

Discard all equipment.

Get away from your snowmobile.

Make swimming motions. Try to stay on top; work your way to the side of the avalanche.

Before coming to a stop, get your hands in front of your face and try to make an air space in the snow as you are coming to a stop.

Try to remain calm.

If You Are the Survivor:

Mark the place where you last saw the victim.

Search for him directly downslope below the last seen area. If he is not on the surface, scuff or probe the snow with a ski pole or stick.

You are the victim's best hope for survival.

Do not desert him and go for help, unless help is only a few minutes away. Remember, you must consider not only the time required for you to get help, but the time required for help to return. After 1/2 hour, the buried victim has only a 50-percent chance of surviving.

First Aid

Treat for suffocation and shock.

AVALANCHE HAZARDS

Low avalanche hazard. Mostly stable snow. Avalanches are unlikely except in isolated pockets on steep snow-covered open slopes and gullies. Backcountry travel is generally safe.

Moderate avalanche hazard. Areas of unstable snow. Avalanches are very possible on steep, snow-covered open slopes and gullies. Backcountry travelers should use caution.

High avalanche hazard. Mostly unstable snow. Avalanches are likely on steep, snow-covered open slopes and gullies. Backcountry travel is not recommended.

Extreme avalanche hazard. Widespread areas of unstable snow. Avalanches are certain on some steep snow-covered open slopes and gullies. Large destructive avalanches are possible. Backcountry travel should be avoided.

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